REVIEW FOR MIDTERM I

PRELIMINARIES:

The midterm will be given in our usual Wednesday classroom and will be 1 hour. The test is closed-book and closed-note. Calculators are not allowed.

The best preparation for any test is to be diligent and keep up over the weeks preceding the test. The second-best preparation for a math test is to *work* problems – since this is what your test will look like. Working problems should come before: reading and high-lighting your notes, reading and high-lighting the text, "looking over" quizzes and homework.

CHAPTER 12: VECTORS AND THE GEOMETRY OF SPACE

- Section 1

  1. terminology: coordinate planes
  2. important ideas: basic graphing in 3D, distance formula in 3D, equation of a sphere, regions of $\mathbb{R}^3$ described by simple algebraic expressions (example: the set of points satisfying $x = 2$ OR the set of point satisfying $x = 2$ and $y = 1$ OR the set of points $z \geq -4$.

- Section 2

  1. terminology: vector versus scalar, components of a vector, standard basis vectors
  2. important ideas: algebraic and geometric interpretation of vector addition, vector subtraction and scalar multiplication, parallel vectors
  3. no "sum of force" applied problems except possibly as extra credit

- Section 3

  1. definitions & theorems: dot product of two vectors, Theorem 3 connecting the dot product with the angle between two vectors, orthogonal vectors, scalar projection and vector projection
  2. skills: compute the dot product and know its geometric interpretation, know how to use the dot product to find the angle between vectors or to determine if two vectors are orthogonal, know how to compute the scalar/vector projection of one vector onto another and their geometric interpretations,
  3. no work problems or orthogonal projection problems except possibly as extra credit

- Section 4

  1. definitions & theorems: cross product, scalar triple product, Theorem 9 relating the cross product and the angel between vectors,
  2. skills: know how to compute the cross product (scalar triple product) and know its geometric interpretations related to (i) orthogonality, (2) angle between vectors, (3) parallel vectors and (4) area or volumes.
  3. no torque problems except possibly as extra credit

- Section 5

    1. terminology: normal to a plane, parametric(vector, symmetric) forms of a line
    2. skills: know how to write the equations of lines and planes, know how to use equations of lines and planes regardless of the form in which they are given. (example: Find the equation of the plane containing three points P, Q and R. OR Find the equations of the line containing points P and Q.), know how to find points of intersection
    3. You do not need to memorize the formula for the distance between a point and a plane. However, GIVEN a particular point and a particular plane you should be able calculate this distance. (example: Given the point P(1,1,1) and the plane $-x + 2y - z = 1$, find the distance between the two.)

- Section 6

    1. terminology: cylinders and quadric surfaces, traces, planes parallel to coordinate planes, ellipsiod, cone, elliptic(hyperbolic) paraboloid, hyperboloid (of one or two sheets).
    2. skills: know how to find and draw specific traces of a surface, know how to put traces together to identify/describe surfaces

CHAPTER 13:

- Section 1

    1. terminology: vector-valued function, parameter
    2. skills: know how to use and sketch the graph of a (simple) vector-valued function,

- Section 2

    1. skills: know how to differentiate and integrate vector-valued functions, know how to interpret the derivatives and integrals of vector-valued functions

- Section 3

    1. definitions: arc length, arc length function, unit tangent vector
    2. skills: know how to find the arc length of a vector-valued function, know how to build the arc length function of a vector-valued function given a starting point, know how to parametrize a function with respect to arc length and how to interpret the result
    3. no questions about the unit normal or binormal

- Section 4

    1. skills: know how to find velocity and acceleration of a particle in 3D given its position function, know how to find the position of a particle given its acceleration (or velocity) and appropriate initial conditions, know how to model projectile motion in 2D given appropriate information. (I'll give you the acceleration of gravity constant in the right units.)